

changes in the blood, pointing to an excess of or a diminution in certain important constituents, are measured by reference to a normal blood color taken as a standard. In Gower's instrument the blood under examination is diluted with water, drop by drop, until it corresponds in color to that of a tube of red fluid assumed to exactly correspond in shade with a one-per-cent. solution of normal blood. In practice this little instrument presents several defects, which I intend, later on, to point out. A more pretentious measurer of abnormal blood, and one which conforms more closely than Gower's to those conditions that have been found necessary for exact chromometry, is that of Fleischel von Marxow, first patented in 1885. Here the blood is compared with a standard ruby glass, the shade of which is increased or diminished by a simple screw movement until it corresponds in color with the blood mixture under examination. The absence of any arrangement for cutting off the side lights appears to me to reduce the value of this instrument for chromometric purposes.

The attempt to compare the standard glass now used in the Fleischel instrument with blood samples is beset with difficulties. Lovibond's early experiments (*loco cit.*, p. 14) showed this. "Colored glass," he says, "was next tried, and long rectangular wedges in glass of different colors, with gradually graded tapers, were ground and polished for standards, whilst corresponding tapered vessels were made for the liquids to be measured. These were arranged to work, at the end of the instrument, up and down at right-angles before two apertures, side by side, with a fixed centre line to read off the thickness of each before the aperture when a color match was made; but here also the difference of ratio between the thickness and color depth of the different colored glass and liquids proved fatal to the method.

"An incidental observation was made during these experiments concerning the difficulty of arriving at a final judgment with tapering colors, owing to one shade gradually blending into the next without a break of any kind to arrest the vision. The mental effort to arrive at a decision, under these conditions of gradual color-blending, was troublesome and vexatious in the extreme. Any person may realize this difficulty by attempting to fix a definite point by the vision in a graduated color line. I was enabled entirely to remove the difficulty by using separate glass slips for standards; the line of color decision made by each additional standard-glass slip used being a precise definition between the most minute shades."